

## **4. MEASURING THE PERFORMANCE OF THE PROGRAM**

A critical question in the implementation of the Blue Skies program is: How will the performance of the Blue Skies program be measured? This chapter first discusses the challenge facing agencies in measuring program effectiveness and then discusses the performance measurement framework, including the general characteristics of measures of effectiveness (MOEs). Next, the chapter reviews how outreach programs of peer jurisdictions have measured outreach effectiveness. The following section describes the recommended MOEs designed to quantitatively measure the success of the Blue Skies program. The final section discusses implementing the MOEs to evaluate the performance of the Blue Skies program.

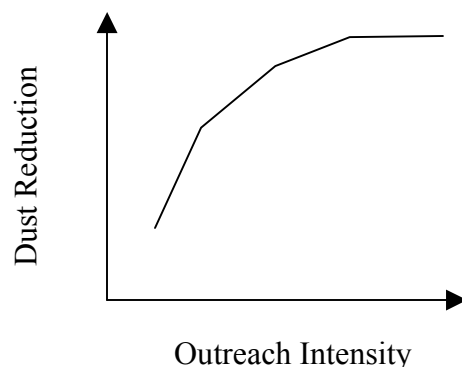
### **THE CHALLENGE**

The ultimate goal of the Blue Skies program is to reduce dust at construction sites by improving dust control through outreach to the construction industry. However, measuring the success of the program in reducing dust is a difficult challenge. Two questions need to be addressed to measure success. First, what is the success of the outreach program in raising the education level of construction personnel in applying dust control practices? Second, has the improvement in education levels of construction personnel in fact resulted in reduced fugitive dust at construction sites? The first question may be easier to answer than the second question. Direct measures can be constructed for measuring participation and knowledge levels achieved in the Blue Skies program. However, linking the Blue Skies program to a reduction in  $PM_{10}$  at construction sites is much more difficult.

What needs to be ultimately accomplished is to relate the level of outreach to the reduction in fugitive dust, as illustrated in figure 8. The measurement of performance will be looking at the incremental changes in  $PM_{10}$  emissions and other indicators with the Blue Skies program in place. However, other activities and other programs aimed at reducing  $PM_{10}$  will be simultaneously occurring. What is the contribution of the Blue Skies program in reducing fugitive dust? How does one separate the effect of the Blue Skies program from that of another? In addition, the Blue Skies program will have multiple activities such as a training course, a Web site, media spots, and the like. What is the contribution of each activity or collective activities to reduction in  $PM_{10}$ ?

### **MEASUREMENT FRAMEWORK**

The May-June 2002 edition of TR News contained an article titled “Measuring the Effectiveness of Public Involvement Approaches” that emphasizes the importance of developing a framework for both the public involvement activities themselves and the methods for measuring the effectiveness of these activities.<sup>[7]</sup> A framework has been developed to meet the challenge of measuring the success of the Blue Skies program. The



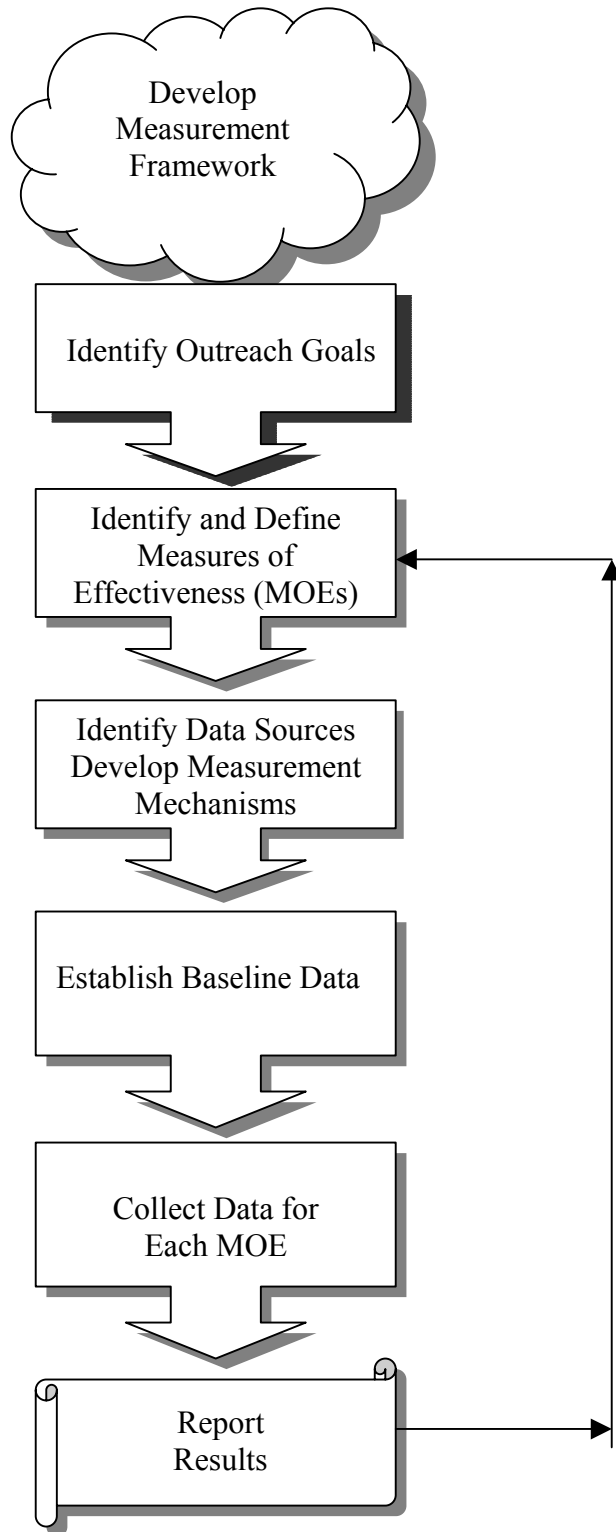
**FIGURE 8. RELATIONSHIP BETWEEN THE LEVEL OF OUTREACH AND THE AMOUNT OF FUGITIVE DUST REDUCTION**

step-by-step procedure shown in figure 9 is recommended for measuring the performance of the Blue Skies program. MOEs have been developed by this research to address the goals of reducing dust at construction sites and increasing participation in the Blue Skies program by quantitatively measuring the effectiveness of the Blue Skies program. Elements of performance measurement are presented in table 9. The MOEs developed for this study are discussed in more detail following a review of how other agencies measure performance of air quality outreach programs.

#### **MEASURES OF EFFECTIVENESS EMPLOYED BY PEER JURISDICTIONS**

The project team conducted an extensive search by Internet, e-mail, and telephone in an effort to identify peer jurisdictions that are employing methods to measure the effectiveness of their outreach programs. Where possible, the persons responsible for employing the MOEs were interviewed. In some cases, colleagues in other departments—or in other peer agencies—were the source of the information. A concurrent literature search was conducted, and candidate contacts in peer jurisdictions were identified in the process of reviewing the literature. Table 10 lists the persons contacted.

Nearly all the agencies contacted are conducting one or more periodic and/or ongoing outreach programs. All the agencies are also monitoring the levels of some or all of the criteria pollutants. All are tracking the trends of benchmarks such as numbers of days containing exceedances, number of complaints received about fugitive dust, numbers of violations issued, and so forth. However, in most instances, the agencies are not undertaking formal efforts to connect the outreach activity with the air quality levels.



**FIGURE 9. FLOW CHART OF PERFORMANCE MEASUREMENT**

**TABLE 9. ELEMENTS OF PERFORMANCE MEASUREMENT**

<b><i>Why Have Performance Measurement?</i></b>
<ul style="list-style-type: none"><li>• Set goals and standards</li><li>• Detect and correct problems</li><li>• Manage, describe, and improve processes</li><li>• Document accomplishments</li></ul>
<b><i>In general, a good measure:</i></b>
<ul style="list-style-type: none"><li>• Is accepted by and meaningful to the customer</li><li>• Tells how well goals and objectives are being met</li><li>• Is simple, understandable, logical, and repeatable</li><li>• Shows a trend</li><li>• Is unambiguously defined</li><li>• Allows for economical data collection</li><li>• Is timely</li><li>• Is sensitive</li></ul>
<b><i>A successful performance measurement system:</i></b>
<ul style="list-style-type: none"><li>• Comprises a balanced set of a limited vital few measures</li><li>• Produces timely and useful reports at a reasonable cost</li><li>• Displays and makes readily available information that is shared, understood, and used by an organization</li><li>• Supports the organization's values and the relationship the organization has with customers, suppliers, and stakeholders</li></ul>
<b><i>A typical definition of a measure includes:</i></b>
<ul style="list-style-type: none"><li>• A specific goal or objective</li><li>• Data requirements, such as the population the metric will include, the frequency of measurement, and the data source</li><li>• The calculation methodology, including required equations and precise definition of key terms</li><li>• Reports in which the data will appear and the graphic presentation that will eventually be used to display the data</li><li>• Any other relevant rationale for the measure</li></ul>
<b><i>A clear data collection plan helps streamline the data collection process:</i></b>
<ul style="list-style-type: none"><li>• Identify how much data needs to be collected, the population from which the data will come, and the length of time over which to collect the data.</li><li>• Identify the charts and graphs to be used, the charting frequency, the type of comparison to be made, and the calculation methodology.</li><li>• Identify the characteristics of the data to be collected: attribute data are things that can be counted; variable data are things that can be measured.</li><li>• If the performance measure is new, try to identify existing data sources or create new sources. All data sources need to be credible and cost effective.</li></ul>

Source: Office of the Vice President, *National Performance Review, Serving the American Public: Best Practices in Performance Measurement*, June 1997<sup>[8]</sup>, as cited by the US DOT Office of Operations

**TABLE 10. PERSONS CONTACTED ABOUT MEASURES OF EFFECTIVENESS**

<b>Agency</b>	<b>Person Contacted</b>
Clark County Department of Air Quality Management	Will Cates, Chuck Richter, and Ron Smolinski
Larry Walker Associates	Betsy Elzufon
Minnesota Pollution Control Agency	Rebecca Helgesen
Oregon Department of Environmental Quality	Kathleen Craig, Agency Toxics Coordinator
Puget Sound Clean Air Agency	Rick D. Hess, Supervising Inspector
San Diego Air Pollution Control District	Anita Tinsley, Public Information Officer
San Diego County Association of Governments	Elisa Arias, Senior Transportation Planner
San Joaquin Valley Air Quality Management District	Charlie Goldberg
South Coast Air Quality Management District	Michael Laybourn
Southwest (Washington State) Clean Air Agency	Kathy Carlson, Public Information Specialist
Spokane County Air Pollution Control Authority	Lisa Woodard, Public Information Officer
Texas Commission on Environmental Quality	Israel Anderson, Director, Small Business and Economic Assistance Kim Herndon, Strategic Assessment Division

Information learned from the interviews conducted with the persons listed in table 10, regarding their agencies' outreach programs, are presented in the following summaries.

### **California Air Quality Agencies**

The San Joaquin Valley is the Nation's largest air basin and also experiences some of the Nation's worst air quality. The San Joaquin Air Quality Management District conducts a comprehensive educational outreach program using the Web, radio, television, and print media, and partners with both local public jurisdictions and private sector industry. A consortium of environmental consulting firms developed "Quantification Methods for Identifying Emission Reductions Resulting from Seasonal and Episodic Public Education Programs" (quoted verbatim) for a number of California air quality agencies.<sup>[9]</sup> The project was funded by the California Air Resources Board (CARB), and the final research report was published on April 30, 2003. The San Joaquin Valley Air Quality Management District and the Sacramento Metropolitan Air Quality Management District participated in the project. The project reviewed "Spare the Air" outreach programs conducted in Sacramento, the Bay Area, and the San Joaquin Valley, and assessed conclusions from prior evaluations of the

programs. The previous methods for measuring the effectiveness of these programs were evaluated, and modified methods were developed. The project concluded that surveying the target audience—in this case the general public—was an effective means of measuring the effectiveness of the programs provided the surveys were conducted properly. The exact wording of the survey questions and the order in which the questions were asked were both deemed critical to the validity of the survey.

The method that was developed involved the following steps:

- Identify the target audience of the outreach program.
- Identify, through surveying, two groups.
  - ✓ Members of the audience that respond to the program’s message.
  - ✓ A control group of audience members that ignore the program’s message.
- Gather, through surveying, data about the activities of both groups that will document the behavior (such as driving) targeted for modification by the outreach program.
- Structure the wording of the survey questions and the order in which the questions are asked to avoid “tipping off” the interviewees about the purpose of the survey until the end.
- As a final question, ask questions designed to determine the interviewee’s level of awareness with respect to the outreach program.

The method involved was tested on drivers in the Sacramento area during 1999 and 2000. Surveys of drivers were conducted by telephone in the evenings following a “Spare the Air” air quality alert as well as on days without air quality alerts (“non-alert days”). Two sample populations were identified: First, a group of drivers who said that they intentionally modify their driving habits because of the alerts (“reducers”), and second, a control group who ignored the outreach efforts (“nonreducers”). By conducting surveys of both groups on both air quality alert days and nonalert days, the two sets of data could be compared.

The Sacramento experiment appeared to validate the proposed method and also revealed that the outreach program was successful in significantly reducing vehicle miles traveled during ozone-alert days. A “*Quantification Method Reference Manual*” also prepared for the CARB documents the recommended method.<sup>[10]</sup>

### **Clark County Department of Air Quality Management**

Clark County Department of Air Quality Management enforcement officers respond to complaints and also spot check jobsites to ensure that Rule 94, Clark County’s fugitive dust control ordinance, is being complied with. The department coordinates with the industry, and proactively seeks industry input on which outreach efforts are most effective. County planners attend monthly meetings of construction industry associations to share information about revisions to regulations and new construction projects. The department just completed

a comprehensive revision of Rule 94, and used focus groups and public open houses to obtain input from the construction industry and the general public.

Levels of criteria pollutants in Clark County are constantly monitored, and the number of exceedances per year are tracked. However, the monitoring data is not directly correlated with outreach efforts.

### **Maricopa County Environmental Services Department (MCESD)**

The MCESD recently completed a “Rule Effectiveness Study for Salt River PM<sub>10</sub> Study” to review implementation and enforcement of county regulations concerned with control of airborne particulates, including Maricopa County Rule 310.<sup>[11]</sup> The study team visited earthmoving sites in the study area, and conducted inspection procedures consistent with those proposed to be implemented in order to determine:

- Whether MCESD and the ADEQ inspection procedures are adequate to identify and reconcile compliance with rule requirements.
- The effect that the rule has had on reducing fugitive dust.

The sites inspected were found to be an average of 90 percent in compliance with Rule 310.

The study documented EPA guidelines with respect to the conduct of surveys designed to gather representative data. The study team concluded that inspecting 15 of the 300—or 5 percent—earthmoving sites in the study area resulted in a sample size that would comply with the guidelines obtained from the EPA.

### **Minnesota Pollution Control Agency**

Minnesota is in attainment for all the criteria pollutants; however, the Minnesota Pollution Control Agency is concerned about potential ozone exceedances. The agency is just beginning to develop educational programs in an effort to avoid ozone nonattainment and will be interested in air quality sustainability programs developed by peer agencies. Prior to now, no funds have been spent on outreach or education and, as a consequence, no MOEs have been considered, developed, or applied in Minnesota with respect to air quality outreach.

## **Oregon Department of Environmental Quality**

The State of Oregon, including the Portland area, is in attainment for all criteria pollutants including particulates, and the construction industry in the State is not regulated with respect to fugitive dust generation. Currently, no outreach programs are conducted by the Oregon Department of Environmental Quality. However, the agency is considering the implementation of air quality sustainability programs in the future due to concerns about the increased incidence of asthma in certain areas of Portland. No measures of effectiveness are used by the agency.

## **Puget Sound Clean Air Agency (PSCAA)**

The PSCAA is responsible for the maintenance and enforcement of air quality standards for four Seattle-area counties. The local chapter of the Associated General Contractors (AGC) complained to the agency about the number of Notices of Violation (NOVs) that were being issued for fugitive dust generation during the hot summer months. The PSCAA partnered with the AGC to produce a 24-page “Guide to Handling Fugitive Dust from Construction Projects” that explains the need for fugitive dust control and the best practices. Approximately 3,000 of the guides have been printed and distributed. The AGC originally paid for the design of the brochure, but the PSCAA is currently paying for the printing.

The PSCAA does not spot check sites. When a complaint about fugitive dust generation is received, the site is inspected. If the amount of fugitive dust being generated exceeds that allowed by the regulations of the local jurisdiction in which the site is located, then an NOV is issued.

Rick Hess, supervising inspector of the PSCAA, has also made approximately two one-hour presentations per month to construction industry personnel over the past two years. During each presentation, every participant receives a copy of the guide. So far, he has spoken to more than 2,000 members of the industry.

The effectiveness of the outreach program has been measured by tracking the numbers of complaints received annually, as well as the number of NOVs issued. The rate of compliance is higher since the program began, and the average number of complaints received annually has dropped from 300 to less than 100.

## **San Diego Air Pollution Control District**

The San Diego Air Pollution Control District has found that surveys are the best tool for obtaining feedback from the public. Recipients of collateral material from the Agency often respond to disguised surveys by joining a “Clean Air Club” or completing other actions that enable the Agency to track which literature was read or what Web page was visited. The effectiveness of Agency programs are not measured specifically with respect to outreach activities conducted by the Agency. However, each Agency department tracks the programs for which that department is responsible. For example, the Complaint Department tracks the trend of complaints from year to year, and the Vehicle Buy-Back Program tracks the cost-

effectiveness of its program. All departments participate in an annual review, where goals and objectives are established based on the prior year's performance of each department.

### **Southwest [Washington State] Clean Air Agency**

The Southwest Clean Air Agency, which has jurisdiction over air quality in several counties in Southwest Washington State, in the suburban Portland area, conducts a number of outreach programs including a comprehensive Web site, newsletters, and brochures. At public events that the agency sponsors or at events in which the agency participates, the agency keeps track of which brochures and handouts seem more popular by counting the inventory of collateral material at the end of the day.

One innovation implemented by the agency is the creation of four portable kiosks that can be transported to area schools and libraries. The kiosks can be accessed like computer terminals and disseminate air quality information in entertaining ways, including an "Air Quality Jeopardy" game that can be played by a user. The agency tracks the usage of these kiosks by requesting demographic information from each user and tying that data to the location of the kiosk at the time the information was entered. The kiosks have proved popular with school administrators and others, and are reserved in advance for visits averaging several weeks.

While the kiosks are targeting primarily young persons, the agency is also involved in another outreach effort in a small town whose residents are mostly senior retirees. The community does not have a trash recycling program, and many of the residents are in the habit of burning trash. The agency is educating the residents on the health hazards of trash burning and is encouraging residents to turn in their "burn barrels." As an incentive, the agency is working with a local office supply store to provide discounts for the purchase of a paper shredder by anyone who has surrendered a burn barrel. The effectiveness of the program is being measured by the number of burn barrels being collected, as well as the trend in the numbers of complaints received from neighbors of trash burners.

### **Spokane County Air Pollution Control Authority**

The Spokane County Air Pollution Control Authority (Spokane APCA) has created written tools for communicating fugitive dust concerns to the construction industry, including a widely distributed guidebook and brochure. In addition, the Washington State AGC developed a manual for AGC members. However, the Spokane APCA has not developed any measures of effectiveness for these outreach efforts. According to Spokane APCA officials, field reviews suggest that area contractors are cognizant with fugitive dust-related regulations and are for the most part complying with the rules. In any event, the Spokane APCA experiences very few repeat violators.

Several strategies have been employed in the Spokane area to meet and maintain the PM<sub>10</sub> standard; however, fugitive dust from construction activities was not found to be a major contributor to PM<sub>10</sub>.

## **Texas Commission on Environmental Quality**

The Texas Commission on Environmental Quality conducts a number of outreach efforts including an annual Environmental Trade Fair and Conference. The commission has obtained a copy of the “Quantification Method Reference Manual” prepared for the CARB, and is evaluating the possible development of MOES modeled after those recommended to the CARB.

## **Other Resources**

In addition to the interviews conducted and summarized above, two other resources provide additional information regarding the effectiveness of outreach programs.

### ***Texas Transportation Institute***

In 2001, the Texas Transportation Institute (TTI) conducted a “National Public Outreach Program Audit Update” that examined the outreach programs being conducted by agencies located in nonattainment areas nationwide.<sup>[12]</sup> Agencies interviewed were asked which outreach activities were most effective and which were not. Key conclusions of the audit were:

- Broadcasting is perceived to be the most effective way to generate public awareness of air quality and the air quality program message.
- Web sites are another effective way to convey air quality information such as ozone alerts and forecasts, and also provide a means of incorporating an interactive component into the program.
- Program representatives felt that where possible, the program should have a “live” presence in the community (i.e., appearance of program personnel at community events).

Followup surveys conducted by several of the agencies confirmed the effectiveness of broadcasting, Web sites, and participation in live events. A number of the agencies surveyed by TTI have been measuring the performance of their programs in some manner. A matrix of these agencies and their performance measures is shown in table 11.

## **Commonwealth of Virginia Department of Planning and Budget**

Virginia’s Department of Planning and Budget provides an online “Guide to Virginia’s Performance Budgeting Process” for use by all Virginia agencies.<sup>[13]</sup> Section 3 of this

**TABLE 11. MATRIX OF MEASURES OF EFFECTIVENESS USED BY PEER AGENCIES**

Program Title	Agency	Components	Audience	Measure of Effectiveness	
				No. of companies participating	Message
Spare the Air	Sacramento Metro Air Quality Management District (AQMD)	Advertising • Brochures E-mail • Fax • ITS* Special Events • Web site	Employers General public Youth	Use alternate modes on ozone action days	
Spare the Air	Bay Area AQMD	Advertising • Brochures E-mail • Fax • ITS Special Events • Web site	Employers General public	Level of public involvement	Smart commuter choices can improve air quality
Air Quality Public Education	Regional Air Quality Council – Denver	Advertising • Brochures E-mail • Press releases Special Events	Employers General public	Level of employer/commuter participation	Practice trip reduction (telecommute, carpool, mass transit) on ozone action days
Clean Air Campaign	Georgia State Environmental Agency	Advertising	Employers General public	No. of members	Focus on traffic congestion
Clean Air Updates	Nebraska DEQ	Workshops • Seminars Direct mail	General public Technical Professional	No. of attendees	How to stay in attainment
Smoking Vehicle Program	Nevada Dept. of Motor Vehicles and Public Safety	Billboards • Advertising Promotional materials Phone hotline • Press releases Direct mail	General public	No. of complaints	Cleaning up our air is a call away
Clean Air Fair	Washoe County District Health Department	Advertising • Flyers Promotional materials Special events	General public	No. of attendees	General air quality
Don't Burn Against the Light	Washoe County District Health Dept.	Brochures • Phone hotline Promotional materials Press releases • advertising	General public	Followup surveys	Use alternative transportation on no-burn days
Ozone Action Partnership	Pennsylvania Dept. of Environmental Protection	Billboards • Special Events Press releases • Web site • Brochures Phone hotline E-mail	Employers General public	Followup surveys	Health impacts of ozone – what individuals can do to help
Air Watch Northwest	Puget Sound Clean Air Agency	Advertising • Brochures	Employers General public	Followup surveys	Help people understand relationships between their own actions, the weather, and air quality
Ozone Action Days	Wisconsin Dept. of Natural Resources	Press releases • Press releases • ITS • Fax • E-mail • Phone hotline • Web site	Employers General public	Followup surveys	Tips on what individuals can do – every little bit can help or hurt

Source: "National Public Outreach Program Audit Update," Texas Transportation Institute, 2001<sup>[12]</sup>, \*Intelligent Transportation Systems

guide addresses performance measurement and provides comprehensive guidance with respect to measuring the performance of various agency activities. The document provides rationale for and benefits of a system of performance measurement including:

- Charting strategic plan implementation progress.
- Obtaining feedback on constituent satisfaction and demands.
- Indicating the level of achievement of an activity or program.
- Enhancing public understanding of a program.
- Linking the cost of the program to results.
- Assessing how well the agency is meeting established standards.

According to the Virginia Department of Planning and Budget, a successful performance measurement system will have the following characteristics:

- Included in a strategic planning process.
- Focuses on outcomes or results, not processes.
- Uses a few balanced, key indicators to measure performance.
- Generates data consistently over time.
- Includes both internal and external comparisons.
- Reports regularly and publicly.
- Informs both policy and program decisions.
- Promotes swift feedback to managers and front-line employees who can use the information to improve operations.

The Virginia document includes an extensive discussion concerning the implementation of performance measures, including the conduct of a pilot program that is discussed in detail in a subsequent section of this chapter.

## **ADOT**

ADOT itself is conducting surveys that can provide some baseline data and provide as model elements of a future performance measurement program. For example, concurrent with construction and earthmoving work related to the improvement of State Route (SR) 51, residents in the freeway corridor are being surveyed to determine how the freeway construction is affecting them. Postcard survey forms enclosed in plastic sleeves are left on doors in the neighborhood for residents to complete and return to ADOT. Included among the questions asked is whether “Crews have done a good job of controlling construction dust.” The findings of the survey are published in a newsletter and mailed to area residents.<sup>[14]</sup> Extra copies of the newsletter are also provided to local merchants for distribution to customers.

The experiences of peer agencies were reviewed and evaluated in the process of developing recommended measures of effectiveness. These recommended measures are discussed in the following section.

## RECOMMENDED MEASURES OF EFFECTIVENESS

This section recommends MOEs that could be used to assess the proposed Blue Skies program.

Table 12 lists potential MOEs, which are grouped under two categories: 1) reducing fugitive dust; and 2) educating the construction industry. Some of the measures will require that new mechanisms be implemented to collect data while other measures could use existing data-collection mechanisms.

**TABLE 12. OUTREACH PROGRAM MOES**

Measure
<b>Reducing Fugitive Dust</b>
<ul style="list-style-type: none"><li>• Annual change in the Phoenix area visibility index.</li><li>• Trends in annual PM<sub>10</sub> concentrations at monitors located near construction dust sources.</li><li>• Number of construction dust complaints per acre.</li><li>• Number of Rule 310 corrective actions issued per earthmoving site inspection.</li><li>• Weighted percent compliance with Rule 310 at inspected earthmoving sites and reduction in PM<sub>10</sub> emissions from earthmoving activities.</li><li>• Percent of survey respondents who feel that construction sites are doing a [good/better] job of controlling dust.</li></ul>
<b>Educating the Construction Industry</b>
<ul style="list-style-type: none"><li>• Number of Blue Skies contractors.</li><li>• Number of dust control specialists certified.</li><li>• Number of dust control instructors certified.</li><li>• Number of individuals completing training.</li><li>• Number of unique visitors to the Web Site.</li><li>• Number of toolkits handed out.</li><li>• Number of brochures handed out.</li><li>• Percent of construction company [owners/employees/supervisors] who feel that their firms are doing a [good/better] job of controlling dust.</li><li>• Percent of Blue Skies program trainees who feel that their construction firms are doing a [good/better] job of controlling dust.</li></ul>

### Normalizing the Data

Care should be taken in interpreting MOEs, even if they have been normalized. For example, annual rainfall amounts will affect the visibility index. Should the number of complaints be evaluated per acre under construction, or per number of construction permits issued? The sections labeled “Other Potential Factors Influencing the MOE” under each of the MOE discussions below identify some of the external influences that make it difficult to quantify the effectiveness of the Blue Skies program.

## **GOAL: REDUCING FUGITIVE DUST**

The MOEs discussed in this section have been developed to gauge the success of the Blue Skies program in terms of the ultimate goal, which is to reduce construction dust so that particulate air pollution (PM<sub>10</sub>) is minimized. As previously discussed, measuring the reduction in PM<sub>10</sub> directly attributable to the Blues Skies program is challenging, due to parallel and confounding influences, such as other PM<sub>10</sub> education and outreach efforts, changes to Rule 310 and its enforcement, and serendipitous natural events (i.e., precipitation, high winds, drought conditions). Despite these difficulties, it is important to quantify the effectiveness of the program, to the extent possible, in terms of real-world reductions in pollution.

Each of the following MOEs alone is an indirect measure of the effectiveness of the Blue Skies program in reducing construction dust and PM<sub>10</sub>. Taken in aggregate, however, the MOEs provide a more reliable picture of the general trends in reducing dust and PM<sub>10</sub> at construction sites. Baseline measurements will be taken before the Blue Skies program is initiated, and positive trends in a majority of the MOEs each year thereafter could be at least partially attributed to the Blue Skies program. If the trends in a majority of the MOEs when compared with the previous year are negative, then this would signal a need to strengthen the Blue Skies program (i.e., hold more classes, obtain additional funding, and encourage broader industry participation and certification).

### **MOE – Annual Change in the Phoenix Area Visibility Index**

#### ***Description of MOE***

Executive Order 2000-3 directed the Governor’s Brown Cloud Summit “to establish options for a visibility standard or other method to track progress in improving visibility in the Phoenix area.” In January 2001, the summit recommended an interim visibility measure called “Blue Sky Days,” defined as six hours or more with at least 25-mile visibility. The summit set targets to increase the number of Blue Sky Days in the Phoenix metropolitan area from 250 in 2001 to 275 in 2003. The summit recognized that “Blue Sky Days” was an imprecise visibility measure and recommended that another index be developed utilizing a public participation process. This process called for a representative cross-section of residents of the Phoenix metropolitan area to determine what visual air quality is desirable, what visual range is acceptable, and how often the combination of acceptable visual range and air quality is preferred.

In 2001, House Bill 2538 acted upon the summit’s recommendation and required the ADEQ director to establish a daily visibility index to evaluate and report current visibility conditions and progress towards visibility improvement goals in Area A—the urbanized portion of Maricopa and Pinal Counties. In 2002, ADEQ formed the Visibility Index Oversight Committee and hired a contractor to develop and conduct a public survey.

In May 2003, the committee recommended a Phoenix Area Visibility Index (PAVI) for Area A, based on the results of the public survey. The PAVI is based on the highest daily 4-hour rolling average visibility, and is measured in deciviews. Particulate matter absorbs or deflects light waves in the atmosphere, resulting in a measurable loss—or extinction—of light. A deciview could be defined as the smallest change in the light level (due to the presence of particulate matter) that would be discernable to the human eye.<sup>[15]</sup>

The visibility index will be reported as follows: 14 deciviews or less will be classified as Excellent; 15-20 deciviews, Good; 21-24 deciviews, Fair; 25-28 deciviews, Poor; and 29 or more deciviews, Very Poor. The committee recommended the following visibility goals:<sup>[16]</sup>

- Show continued progress through 2018.
- Move days in the poor/very poor categories up to the fair category.
- Move days in the fair category up to the good/excellent categories.
- Progress assessment to be conducted every five years through 2018.

ADEQ is currently in the process of measuring visibility with transmissometers and will post PAVI values on their Web site. When compared on an annual basis, the PAVI provides a rolling measure of changes in visibility. If the number of days in the higher categories (fair and above) increase by a substantial margin, then visibility has improved, relative to the previous year. Conversely, if the days in the poor and very poor categories increase significantly, then visibility has deteriorated. There would need to be a significant change (i.e., at least 20 percent) in the number of days in these categories in order to signal a human-induced change in visibility, since weather and other uncontrollable conditions (i.e., wild fires) could result in normal annual fluctuations.

While PM<sub>10</sub> in general, and construction dust in particular, is a minor contributor to regional visibility impairment, significant changes in the PAVI could be a trigger for improvements in the Blue Skies program. If the PAVI worsens, especially in tandem with negative trends in a majority of other dust reduction MOEs, then this could serve as an indicator that the Blue Skies program needs to be strengthened. On the other hand, if the index shows no change or a visibility improvement in a given year, no adjustment to the Blue Skies program would be warranted, at least on the basis of its impact on visibility.

### ***Data Collection***

ADEQ is collecting data and will post the information necessary to determine the annual rate of change in the PAVI. A date should be chosen to assess the change each year, for example, January 1. If the number of days in the poor and very poor categories increases significantly (i.e., by more than 20 percent) relative to the previous year, then it could be assumed that visibility is deteriorating and action to strengthen the Blue Skies program should be considered. Otherwise, visibility is either not changing significantly or is improving, in which case, no action to improve the Blue Skies program would be indicated.

### ***Other Potential Factors Influencing the MOE***

Other factors potentially affecting the annual change in PAVI include:

- Climate.
- Forest fires.
- Increased enforcement of Rules 310 and 310.01.
- Other PM<sub>10</sub> control measures.
- Stricter Federal standards for light duty and heavy duty tailpipe emissions.
- New measures that may be implemented to reduce regional haze in Class I wilderness areas (i.e., the Superstitions).
- Stationary source emissions (i.e., SO<sub>2</sub> from power plants).
- Transport of air pollutants from elsewhere (i.e., California, Texas, Mexico or Asia).

### **MOE –Trends in 24-Hour PM<sub>10</sub> Concentrations at Monitors Located Near Construction Dust Sources**

#### ***Description of MOE***

Currently, the PM<sub>10</sub> monitors in the Phoenix Metropolitan region located closest to sources of construction dust are the West Chandler monitor, near the construction of the San Tan Freeway, and the Higley monitor, near the growing town of Gilbert. The average 24-hour PM<sub>10</sub> concentration each year at these monitors would be an indirect measure of the effect that the Blue Skies program is having on construction dust, especially if a concerted effort is made to provide training and outreach to personnel working on construction projects near the monitors.

#### ***Data Collection***

Maricopa County collects PM<sub>10</sub> data every sixth day at the West Chandler and Higley monitors. The annual average PM<sub>10</sub> concentrations at these two monitors (and others that might be influenced by local construction activity) are provided in an annual report by the MCESD. If these annual values improve each year, then no further action need be taken. However, if these averages worsen, then additional steps should be taken to ensure that dust control training is provided to all employees working at construction sites near the monitors. As employees in these areas are trained, it will be useful to observe the monitored values in subsequent years, keeping in mind that other sources besides construction may be influencing the readings. Providing training to construction employees working near the monitors will reduce the possibility that high PM<sub>10</sub> readings are caused by these sources.

## Other Potential Factors Influencing the MOE

Factors potentially affecting trends in 24-hour PM<sub>10</sub> monitors include:

- Nonconstruction sources of PM<sub>10</sub> located near the monitors such as
  - ✓ Agriculture.
  - ✓ Dirt roads.
  - ✓ Reentrainment created by vehicles on paved roads.
  - ✓ Unpaved parking lots.
  - ✓ Other vacant, disturbed areas.
- Increased compliance with Rule 310.
- Climate (i.e., level of precipitation, number of high wind events).

## MOE – Number of Construction Dust Complaints Per Acre

### *Description of MOE*

Tracking the number of construction dust complaints is a measure of the effectiveness of the Blue Skies program, as well as efforts on the part of the construction industry and Maricopa County to increase compliance with Rule 310. To correct for normal fluctuations in regional economic activity, this measure should be normalized to (divided by) the total number of acres for which earthmoving permits have been pulled in any given year.

Reductions in the number of construction dust complaints per acre would indicate that efforts such as the Blue Skies program are successful in reducing dust. Increases in this MOE, especially if accompanied by negative trends in a majority of other MOEs, would indicate a need to strengthen the Blue Skies program, as well as Rule 310 enforcement efforts by Maricopa County.

### *Data Collection*

MCESD would be the source for annual statistics on the number of construction dust complaints and the number of acres covered by active earthmoving permits.

### ***Other Potential Factors Influencing the MOE***

Other factors potentially influencing the number of construction dust complaints per acre are:

- Increased compliance with Rule 310 due to factors other than the Blue Skies program such as:
  - ✓ Other PM<sub>10</sub> training and outreach initiatives.
  - ✓ Increased enforcement by Maricopa County.
  - ✓ Efficacy of environmental management systems conducted by the construction companies.
- Heightened public awareness of the Maricopa County Dust Hotline.

### **MOE – Number of Rule 310 Corrective Actions Issued Per Earthmoving Site Inspection**

#### ***Description of MOE***

The number of corrective actions (Notice to Correct, Compliance Status Notification or Notice of Violation) issued by Maricopa County on earthmoving site inspections is one measure of the level of construction industry compliance with Rule 310. To correct for variations in the number of inspectors and site visits, this measure should be normalized to the total number of construction site inspections conducted in any given year.

Decreases in the number of corrective actions per inspection would indicate that construction sites are complying more effectively with Rule 310. This could be a result of the Blue Skies program and/or other concurrent educational and enforcement efforts on the part of the construction industry and Maricopa County. Increases in this MOE, especially in concert with negative trends in a majority of other MOEs, would signal a need for strengthening the Blue Skies program.

#### ***Data Collection***

MCESD would be the source for annual statistics on the number of Rule 310 corrective actions issued and the number of earthmoving site inspections performed.

### ***Other Potential Factors Influencing the MOE***

Other factors potentially influencing this MOE include:

- Increased compliance with Rule 310 due to factors other than the Blue Skies program such as:
  - ✓ Other PM<sub>10</sub> training and outreach initiatives.
  - ✓ Increased enforcement by Maricopa County.

- ✓ Efficacy of environmental management system conducted by the construction companies.
- Heightened public awareness of the Maricopa County Dust Hot-Line

### **MOE – Weighted Percent Compliance with Rule 310 at Inspected Earthmoving Sites and Reduction in PM<sub>10</sub> Emissions From Earthmoving Activities**

#### ***Description of MOE***

This MOE measures annual compliance with Rule 310 based on construction site inspections. MCESD recently completed a Rule 310 effectiveness study for the Salt River area. As part of this study, 32 earthmoving sites were inspected in December 2002 and the spring of 2003.<sup>[10]</sup> An inspection team visited each site and completed a Maricopa County Earthmoving Site Inspection Form; points were then assigned to each of the Rule 310 requirements as shown in table 13. If a corrective action was necessary for any of the first eight requirements in the table, the points were reduced. If a Notice to Correct was issued, the points were reduced by 50 percent. For a Compliance Status Notification, the points were cut by 75 percent. For a Notice of Violation, no points were awarded. For the last four requirements in the table, either “yes” (all points) or “no” (no points) were assigned.

**TABLE 13. RULE 310 RULE EFFECTIVENESS STUDY POINT SYSTEM**

<b>Requirements</b>	<b>Points</b>
Unpaved haul/access roads	10.00
Disturbed surface areas	10.00
Trenching operations	10.00
Trackout control device	10.00
Trackout along a paved public roadway ( $\leq 50$ ft., $>50$ ft)	10.00
Bulk material handling onsite within boundaries or work site	10.00
Bulk material handling offsite onto paved public roadways	10.00
Water supply/availability	10.00
Permit onsite	1.25
Dust control records onsite	1.25
Project information sign posted	1.25
Visible emissions evaluation conducted	1.25
<b>Total</b>	<b>85.00</b>

Source: MCESD, *Rule Effectiveness Study for Salt River PM<sub>10</sub> Study*, 2003<sup>[10]</sup>

For this MOE, the weighting scheme described above could be applied to all or a statistically-significant random sample of earthmoving inspections conducted by Maricopa County each year. This would provide an annual measure of construction site compliance with Rule 310. A year-to-year comparison of Rule 310 effectiveness for earthmoving activities would indicate whether efforts such as the Blue Skies program, together with other educational and enforcement activities, are having a positive impact on compliance levels. In addition, if there is an increase in effectiveness, this measure can be used to estimate the total annual reduction in PM<sub>10</sub> emissions attributable to improved compliance at construction sites.

### ***Data Collection***

The MCESD could calculate the weighted average Rule 310 effectiveness using all (or a sample) of the Earthmoving Site Inspection Forms completed by their inspectors each year. The PM<sub>10</sub> emissions reduction attributable to increased compliance with Rule 310 at earthmoving sites could be estimated using the PM<sub>10</sub> emissions inventories shown in the *Revised MAG 1999 Serious Area Particulate Plan for PM<sub>10</sub> for the Maricopa County Nonattainment Area*, February 2000. Daily PM<sub>10</sub> emissions in 2001 are shown in Table II-2 of this plan.<sup>[2]</sup> For the construction-related emissions in this table, the Rule 310 compliance rate was assumed to be 30 percent. Daily PM<sub>10</sub> emissions in 2006, assuming implementation of the 77 control measures in the PM<sub>10</sub> plan, are shown in Table VI-1 of this plan. With strengthening and increased enforcement of Rule 310, Table VI-1 assumes that the compliance rate among construction activities increases from 30 to 80 percent in 2006.

### ***Other Potential Factors Influencing the MOE***

Other factors potentially influencing this MOE include increased compliance with Rule 310 due to factors other than the Blue Skies program such as:

- Other PM<sub>10</sub> training and outreach initiatives.
- Increased enforcement by Maricopa County.
- Efficacy of environmental management systems conducted by the construction companies.

## **MOE – Percent of Survey Respondents Who Feel that Construction Sites are Doing a Good Job of Controlling Dust**

### ***Description of MOE***

This MOE addresses public perceptions of the efforts that the construction industry is making to reduce dust. It would be optimal if a survey could be performed before the Blue Skies program begins, in order to establish a baseline of public opinion. Each year, the responses could be tallied to determine if the percent of respondents who feel that construction sites are doing a good or excellent job of controlling dust has changed. Ideally, the annual survey responses will show that construction sites are doing a better job of controlling dust over

time. If so, this improvement could be partially attributable to the Blue Skies program. If there is no improvement in the public's perception, then this would indicate a need to strengthen the Blue Skies program, especially the outreach dimension.

### ***Data Collection***

To be statistically valid, this information would be collected annually as part of a formal public opinion survey using a randomly selected set of interviewees. The question might be posed as follows: "Construction sites in my area are doing a \_\_\_\_\_ job of controlling dust." The choices to complete the sentence would be: excellent, good, fair, poor, and very poor, or much better, better, about the same, worse, much worse.

The number of survey respondents who perceive that construction sites are doing a "good" or "excellent" (or "better" or "much better") job would be divided by the total number of survey responses to calculate the MOE.

### ***Other Potential Factors Influencing the MOE***

Factors that potentially affect this MOE include:

- Increased compliance with Rule 310 due to factors other than the Blue Skies program such as:
  - ✓ Other PM<sub>10</sub> training and outreach initiatives.
  - ✓ Increased enforcement by Maricopa County.
  - ✓ Efficacy of environmental management systems conducted by the construction companies.
- Environmental conditions, i.e., high winds, drought, water shortages.
- Economic conditions, i.e., slowdown in regional construction activity; jump in cost of water and dust palliatives.

### **GOAL: EDUCATING THE CONSTRUCTION INDUSTRY**

Measures of effectiveness discussed in this section measure the success of the PM<sub>10</sub> outreach program in educating the construction industry in dust control at construction sites. These measures fall into three categories: those that involve the evaluation of statistical data; those that involve the review of collateral material inventories; and those that involve the conduct of surveys. Discussions of the three categories of MOEs designed to measure the success of educating the construction industry follow.

## **Measures of Effectiveness Involving the Evaluation of Statistical Data**

Measures involving the evaluation of statistical data include:

- Number of Blue Skies contractors.
- Number of dust control specialists certified.
- Number of dust control instructors certified.
- Number of individuals completing training.
- Number of unique visitors to the Web site.

### ***Descriptions of MOEs***

The number of contractors that have signed up as Blue Skies contractors measures both awareness and support by contractors. The second, third, and fourth MOEs measure the number of construction personnel that have attained specific levels of training in dust control. The final MOE in this category tracks one aspect of awareness of the program by identifying the numbers of persons visiting the Web site.

### ***Data Collection***

Data collection for the first four MOEs entails the tabulation and reporting of statistics collected as Blue Skies contractors sign up, dust control specialists/inspectors are certified, and trainees complete training. The data for these measures should be evaluated biannually.

Online services exist that are able to monitor the traffic of a particular Web site and track the number of unique visits to the site, as recommended by the fifth MOE. For a nominal fee, the program could subscribe to such a service. Depending upon the level of detail desired, data such as the internet domain of each site visitor can be tracked, facilitating a statistical analysis of the audience that the site is reaching.

### ***Other Potential Factors Influencing the MOE***

External events, such as an air quality-related policy or regulation change or controversy, could make the outreach program a hot-button issue, resulting in a sudden spike in program participation as well as Web site visits. While this increased participation will be welcomed, a subsequent defusing of the issue—whether caused by genuine resolution of the air quality issue itself or by the media turning its attention elsewhere—will inevitably result in reduced program participation and site visits. Data collected that reflects these spikes will need to be footnoted so that the real trend of program participation measured by each of these MOEs over time will be evident.

## **Measures of Productivity Involving the Review of Collateral Material Inventories**

Measures involving the review of collateral material inventories are:

- Number of toolkits handed out.
- Number of brochures handed out.

### ***Descriptions of MOEs***

Tracking the volume of collateral material consumed by training sessions or otherwise distributed to interested persons is an additional indicator of the level of interest in the program. Such tracking will need to be conducted routinely by the program coordinator in order to ensure adequate inventories of the material, and these MOEs will require little additional effort.

### ***Data Collection***

Supply counts will be made before and after each event where material is to be distributed and the amount consumed will be logged. Additional information tracked can include the types of events—trade shows, presentations to construction industry groups, and so on—where different brochures seem most popular. The log could be set up as an electronic spreadsheet into which information was entered after each training session or event where material was used. The spreadsheet could be set up so that data entered only once would serve both for inventory control and statistical tracking. As patterns of program participation at periodic events such as presentations to specific organizations become established, comparisons with prior years could be made.

### ***Other Potential Factors Influencing the MOE***

In the formative months and years of the program, collateral materials will be modified and adopted following feedback received from trainees and others to whom they are distributed. Different brochure styles and headlines will appeal to different individuals—perhaps intentionally so. External events, such as an air quality-related policy or regulation change or controversy, could make the subject of a particular brochure—or of the entire outreach program—a hot-button issue, accelerating the consumption of collateral.

## **Measures of Effectiveness Involving the Conduct of Surveys**

Measures involving the conduct of surveys are:

- Percent of construction company [owners/employees/supervisors] who feel that their firms are doing a [good/better] job of controlling dust.

- Percent of Blue Skies program trainees who feel that their construction firms are doing a [good/better] job of controlling dust.

### ***Descriptions of MOEs***

The objectivity of persons directly involved in the activity that is the subject of the outreach program could be questioned. Nevertheless, the perceptions of these individuals provide useful feedback. Construction personnel might be overly optimistic about the performance of their firms with respect to fugitive dust control. Conversely, if construction personnel themselves perceive that elements of the program are ineffective, chances are that the general public will share that view.

### ***Data Collection***

The data would be collected annually in a telephone survey. The interviewees would be selected randomly from lists of licensed contractors and from lists of program trainees. The question to the contractors might be posed as follows:

“Compared with last year, our firm’s ability to control fugitive dust during earthmoving operations has \_\_\_\_\_.”

Where the choices are: improved/ remained the same/ gotten worse/don’t know.

Questions to program trainees could include the same question posed to the contractors as well as:

“With respect to your firm’s ability to control fugitive dust during earthmoving operations: In your opinion, the Blue Skies training you received has proved very \_\_\_\_\_.”

Where the choices are: beneficial/somewhat beneficial/of little benefit/don’t know.

### ***Other Potential Factors Influencing the MOE***

As with the other MOEs designed to measure the effectiveness of industry education, the timing of the surveys with respect to external events will be critical. If air quality is a front page issue at the time of the surveys, interviewees will more likely be willing to participate in the first place, and will be more likely to give optimistic responses regarding the performance of their firms. In the early part of the program, the number of individuals who have already completed training would likely represent too small a sample to render statistically valid data. However, surveying 5 percent of the contractors would fall within EPA guidelines<sup>10</sup> and, at some point at least 5 percent of area construction personnel will have taken the training.

## **IMPLEMENTING PERFORMANCE MEASUREMENT**

This section of the chapter covers the implementation of the measures of effectiveness. First, the initial groundwork for performance measurement implementation is discussed. Next, the concept of a pilot performance measurement program is presented. Finally, the initiation of long-term tracking is discussed.

### **Laying the Groundwork**

At the same time that the Blues Skies outreach and training program itself is being implemented, the groundwork needs to be laid for implementing the procedures for measuring the performance of the program. This groundwork will consist of the following steps:

- Final selection of the performance measures.
- Identification of the types of data needed for the conduct of the measurements selected.
- Identification and development of the procedures for gathering data.
  - ✓ Measurement mechanisms for gathering baseline data.
  - ✓ Measurement mechanisms for long-term tracking.
  - ✓ Establishment of measurement periods for each MOE.
- Establishment of baseline data.
- Development of budgets for surveys, data collection, and analysis.

Table 14 presents a schedule of the recommended MOEs with suggested measurement mechanisms and measurement periods for each.

### **Prototype Performance Measurement Program**

One means of implementing performance measurement that has been used successfully in Virginia agencies is the conduct of a pilot program, testing one or more measures of effectiveness that are a subset of the ultimate array that has been selected.<sup>[12]</sup> One approach would be to identify those measures, such as those listed in the “Reducing Fugitive Dust” section of Table 12, for which baseline data may be readily available. Conversely, baseline data for the MOEs concerned with construction industry training will not become available until some training has already taken place. Just as a prototype training class will be conducted to fine tune the program itself, prototype performance measurement activity can be conducted to assess the complexity and time required for collecting and analyzing different sets of data.

**TABLE 14. MEASUREMENT SCHEDULE**

<b>Measure</b>	<b>Measurement Mechanism</b>	<b>Measurement Period</b>
<b>Reducing Fugitive Dust</b> <ul style="list-style-type: none"> <li>• Measured improvements in the Visibility Index</li> <li>• Declining trends in annual PM-10 concentrations at monitors located near construction dust sources</li> <li>• Reduction in number of construction dust complaints per construction permit, per acre</li> <li>• Reduction in number of violations by construction companies per construction permit, per acre</li> <li>• Increased compliance with Rule 310 at construction sites</li> <li>• Increase in the number of survey respondents who feel that construction sites are doing a better job of controlling dust</li> </ul>	<ul style="list-style-type: none"> <li>• Obtain from ADEQ</li> <li>• Obtain from MCESD</li> <li>• Public opinion survey</li> </ul>	<p>Annually</p> <p>Annually</p> <p>Annually</p>
<b>Educating the Construction Industry</b> <ul style="list-style-type: none"> <li>• Number of Blue Skies contractors</li> <li>• Number of dust control specialists certified</li> <li>• Number of dust control instructors certified</li> <li>• Number of individuals completing training</li> <li>• Number of Web site visits unique visitors</li> <li>• Number of toolkits/brochures handed out</li> <li>• Percent of construction company [owners/employees/supervisors] who feel that their firms are doing a [good/better] job of controlling dust</li> <li>• Percent of Blue Skies program trainees who feel that their construction firms are doing a [good/better] job of controlling dust</li> </ul>	<ul style="list-style-type: none"> <li>• Collect and Tabulate Statistics</li> <li>• Obtain from on-line vendor</li> <li>• Collect and Tabulate Statistics</li> <li>• Survey, Collect and Tabulate Statistics</li> </ul>	<p>Biannually</p> <p>Biannually</p> <p>After each session or event</p> <p>Annually</p>

In addition to facilitating budget refinement for the performance measurement process, the prototype performance measurement activity may suggest additional measures of effectiveness and also suggest appropriate target goals for program performance. The program coordinator, or a staff member who will ultimately be responsible for conducting the performance measurement over the long-term, should perform the prototype measurements

and document each procedure. Elements of the process that should be noted and described include:

- The amount of time, per record, required to conduct each measurement.
- The cost, per question asked, of any surveying performed by a contract firm.
- The availability of data needed for each MOE tested.
- Any issues with respect to the willingness of the sources of data to provide the data, of candidate interviewees to be surveyed, and so forth.
- Any pertinent feedback and suggestions received from data sources or survey interviewees that could be used to improve the process.

Following data collection, the prototype data analysis will include both a statistical evaluation of the data itself and a logic check of the future usefulness of the measure tested. This determination will take into consideration the time involved, anticipated budget constraints, and any difficulties encountered during the data gathering. The findings from the prototype performance measurement exercise will be used to define the procedures for long-term tracking and to develop a budget for the ongoing performance measurement process.

### **Initiation of Long-term Tracking Process**

After the MOEs have been fine tuned subsequent to the prototype exercise, and as the baseline data for each MOE become available, the measurement process for each MOE can be activated as its measurement period occurs. Performance targets should be set for those elements of program performance over which the program has significant control, such as the numbers of persons trained or certified. At the end of the first year of performance measuring, the performance measurement routine itself should be evaluated, and MOEs added, dropped, or modified as needed to enhance the significance of the process.

The findings of the performance measurement process represent an important tool for building and maintaining the political constituency needed to fund ongoing program operations. These findings should be presented in a clear and concise style appropriate for the stakeholders upon whom the program depends.